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MULTIENDPOINT ANALYSIS OF SOMATIC GENETIC DAMAGE IN CHERNOBYL CLEANUP WORKERS

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Determining the optimal strategy for biological dosimetry of human populations exposed to low levels of ionizing radiation is an important goal. Three measures of somatic genetic damage are being evaluated for their individual and collective ability to detect radiation damage. The populations studied are 1) Russians whose assignments while working on cleanup of the Chernobyl nuclear power plant accident of 1986 were intended to limit their exposure to 25cGy or less and 2) matched Russian controls. The endpoints evaluated at this time are: stable chromosome aberrations in lymphocytes detected by fluorescence in situ hybridization; glycophorin A mutation in erythrocytes detected by flow cytometric analysis; and hypoxanthine phosphoribo-syltransferase (HPRT) mutation in lymphocytes detected by cell culture. Peripheral blood samples were collected 6 to 10 years after radiation exposure. Using an in vitro dose response as reference, cytogenetic analyses of 107 workers and 41 controls estimate an average population dose well below 20cGy. The HPRT mutant frequency also detected radiation exposure; it is however less sensitive than chromosome aberration analysis. Adjustment for age and smoking increases the sensitivity of detection of radiation exposure in both lymphocyte assays. The sensitivity of glycophorin A mutant frequency appears to be lower, in part due to limited knowledge of the factors that affect variation in this endpoint. Ongoing studies are directed toward applying the assays on the same samples to enable assessment of the relative merit and optimal deployment of these assays in this and other populations.

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